

## ABSTRACT

### USING HIGH TEMPERATURE ELECTRICAL RESISTIVITY MEASUREMENTS TO DETERMINE THE QUALITY OF DIAMOND FILMS

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The electrical resistivity of diamond films has been measured between room temperature and 1200 C. The films were grown by either microwave Plasma CVD or combustion flame at various different companies. It was found that the room temperature resistivities were all around  $10^{15}$ - $10^{16}$   $\Omega$ -cm, which has been shown to be the apparatus-limited value (higher resistivities cannot be measured). Hence, these resistivity measurements cannot indicate which of the films, which all have very similar Raman spectra, are of the best quality. Also, sample treatment (such as as-fabricated, heat treated, cleaned, etc.) will effect the room temperature electrical resistivity because of different surface conditions. On the other hand high temperature measurements up to 1200 C clearly do show differences for samples that had the same electrical resistivity at room temperature. The high temperature resistivities varied from about one order of magnitude lower than that for natural type IIa diamond to about two orders of magnitude greater over the whole temperature range with activation energies between 1.5 and 1.6 eV. These high temperature measurements are thus very helpful in determining the quality of diamond films.